

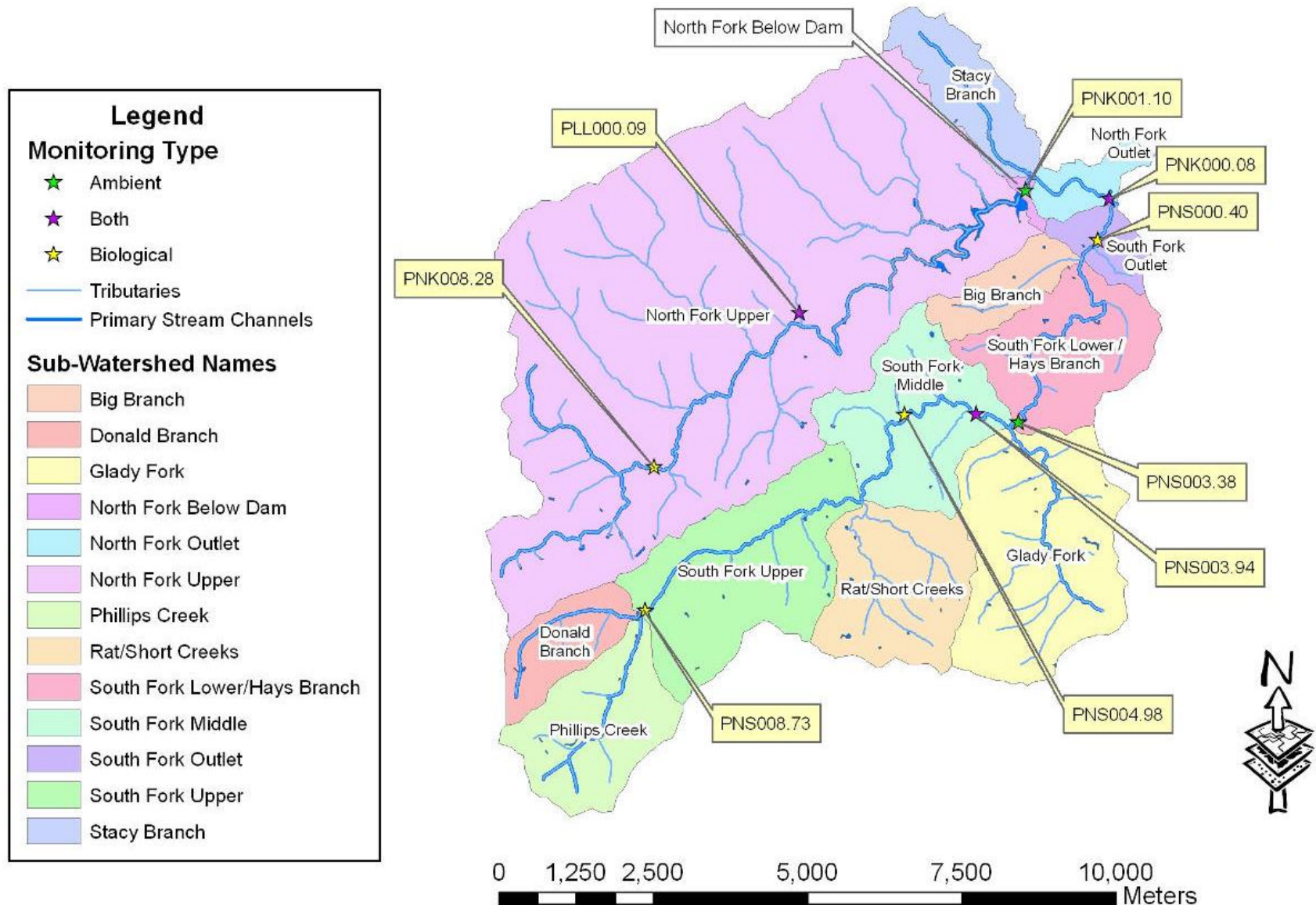
# North Fork and South Fork Pound River Phased TMDLs for Benthic Impairments

Final Public Meeting  
February 2, 2010  
Pound, Virginia

Gene Yagow

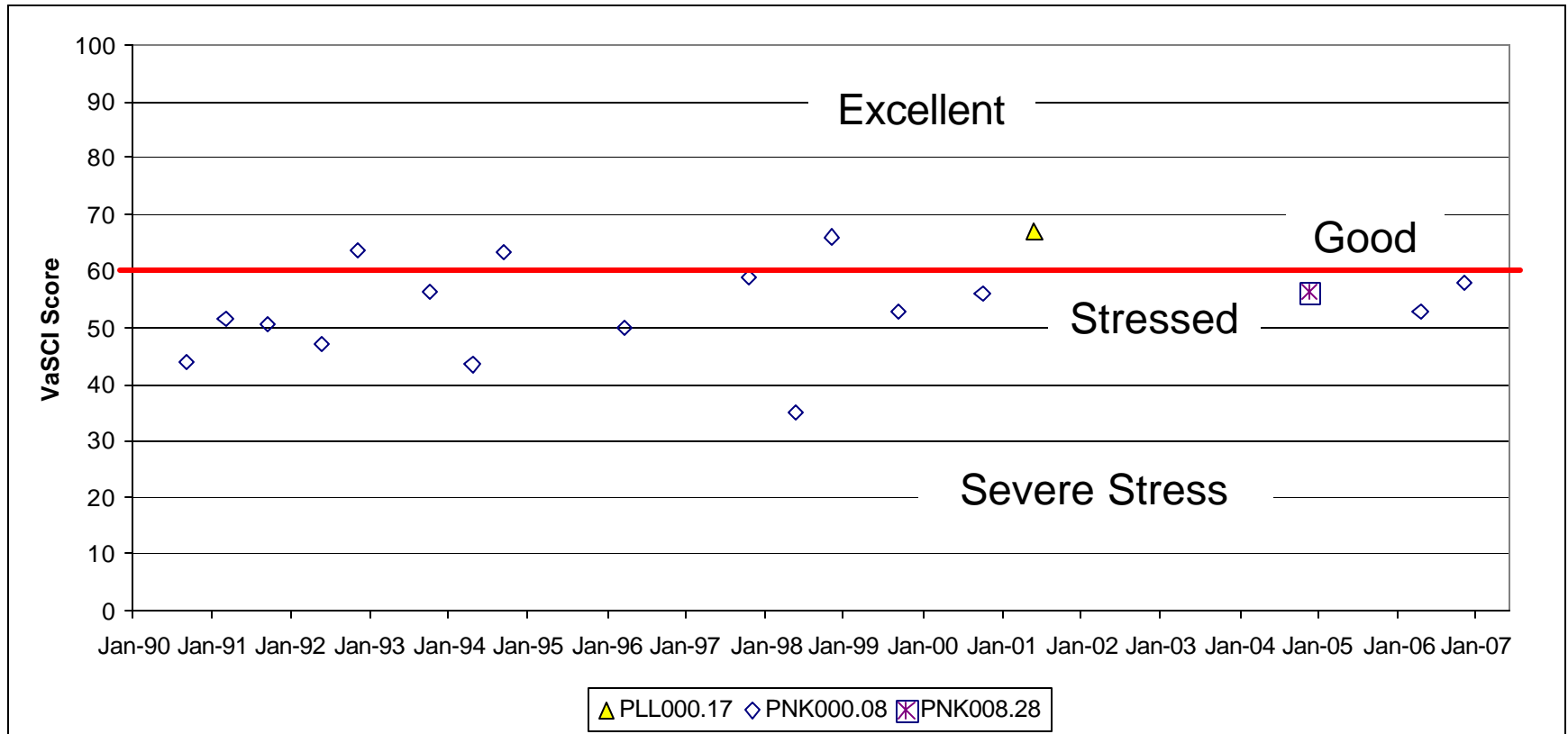


# DEQ Monitoring Points



# Basis of the Biological Impairment

Lower North Fork Pound River



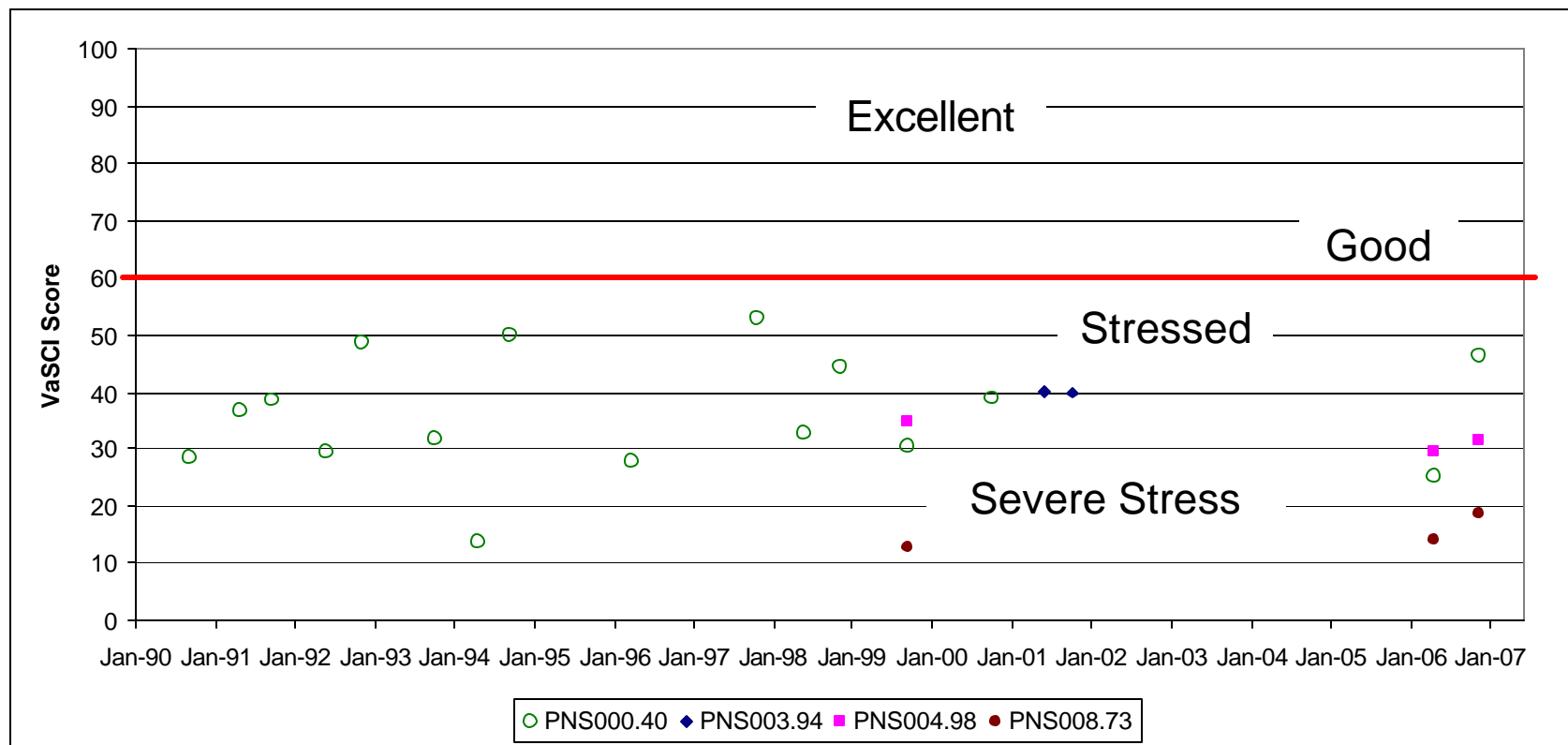
Lower North Fork Pound River: ave. VaSCI = 55.5

PLL = Phillips Creek

PNK = North Fork Pound River

# Basis of the Biological Impairment

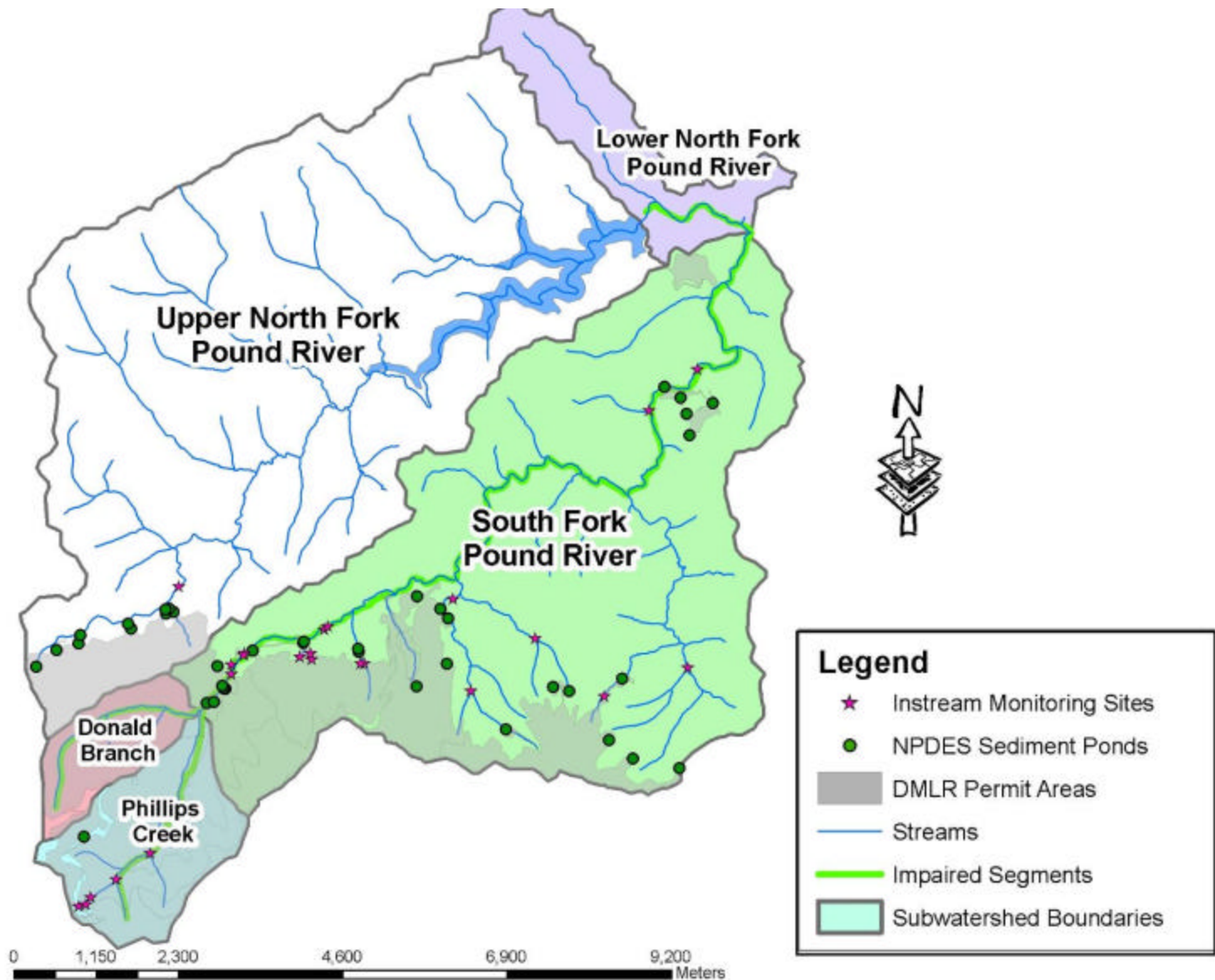
South Fork Pound, Phillips Creek and Donald Branch



South Fork Pound River (PNS003.94): ave. VaSCI = 36.0

Phillips Creek and Donald Branch (PNS008.73): ave. VaSCI = 15.1

# DMLR Permitted Mining Areas



# Stressor Analysis Summary

## Lower North Fork Pound River

- ◆ Hydrologic Modifications
  - ◆ NF Pound Lake controlled discharge
  - ◆ Residential/commercial areas in riparian zone
- ◆ Sediment
  - ◆ Poor habitat metric scores related to sediment
  - ◆ Disturbed areas, especially in riparian zone

# Stressor Analysis Summary

## South Fork Pound River

- ◆ Hydrologic Modifications
  - ◆ Extensive mining, AML, 28 sediment ponds
- ◆ Sediment
  - ◆ Poor habitat metrics related to sediment
  - ◆ Disturbed lands
  - ◆ Large DMLR-reported TSS concentrations
  - ◆ Construction and residential areas in riparian zone
- ◆ TDS
  - ◆ High levels of TDS, conductivity, and sulfate
  - ◆ Sediment pond outfalls, in-stream, and groundwater

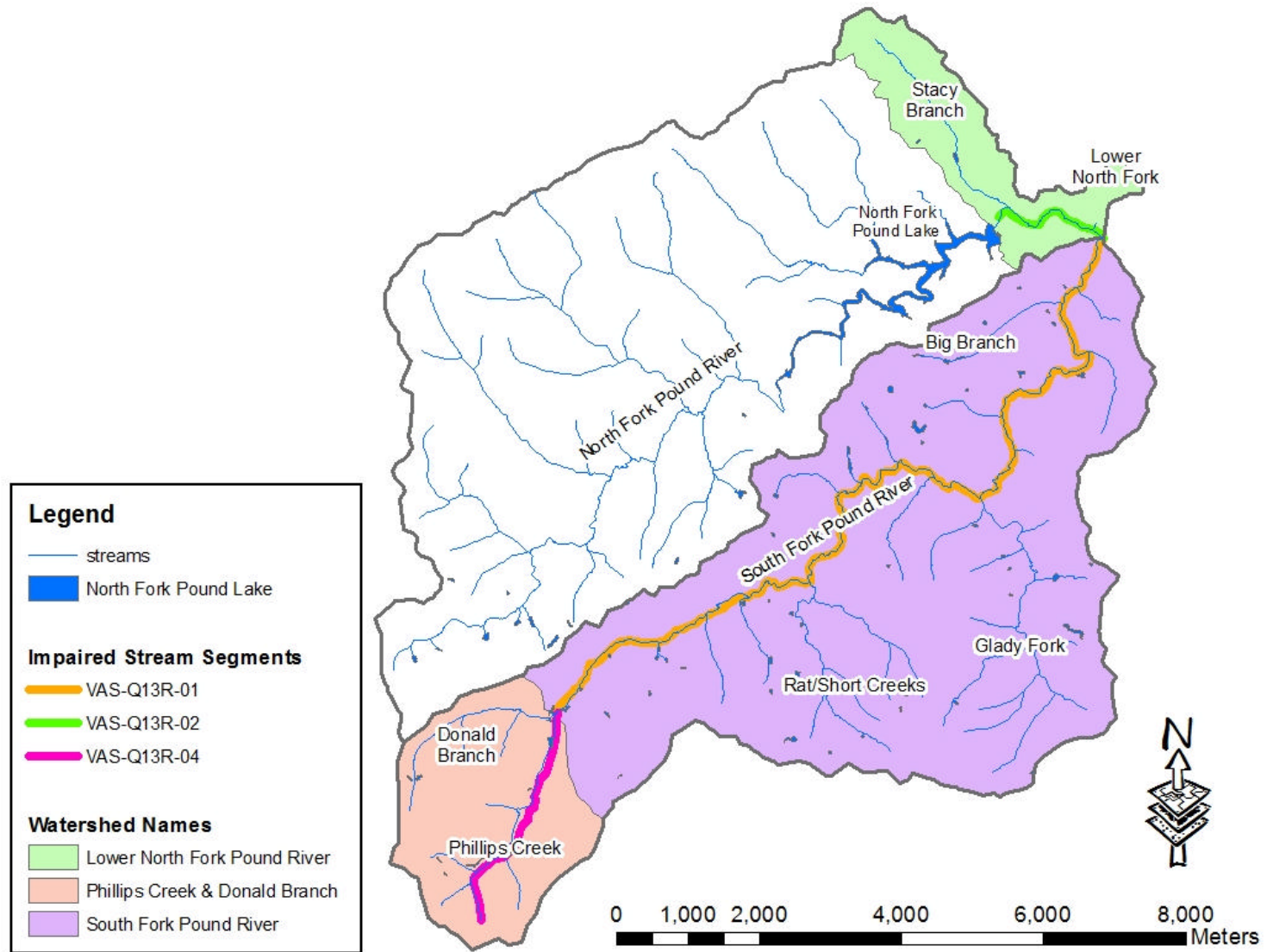
# Stressor Analysis Summary

## Phillips Creek

- ◆ Hydrologic Modifications
  - ◆ Extensive surface alteration from mining
  - ◆ Donald Branch no longer exists
- ◆ Sediment
  - ◆ Primarily visual evidence
  - ◆ Almost totally mined
  - ◆ Considerable AML, much being reclaimed
  - ◆ Low biological diversity, primarily pollution-tolerant organisms
- ◆ TDS
  - ◆ High levels of TDS, conductivity, and sulfate



# Three Impaired Segments



# Changes since the 09/25/08 Public Meeting

- ◆ TMDLS were designated as “phased” TMDLS due to uncertainties in pollutant load distribution among identified sources.
  - ◆ Between AML and mining
  - ◆ Between sources contributing to groundwater loads
- ◆ Correction to the classification of the “barren” land use as a non-mining land use, as originally intended.

# Changes (cont.)

## ◆ Sediment TMDL

- ◆ Used “existing” loads as the basis for reductions, rather than “future” loads that assumed unlimited disturbed areas within each mining permit.
- ◆ Changed simulation period to 1995-2007, which corresponds with the period after which DMLR began electronic record keeping. Previously, the simulation period was 1985-2003.
- ◆ Calibrated the GWLF model using DMLR observed flow and TSS data to ensure closer comparability with DMLR accounting procedures for regulated permit waste loads.

# Changes (cont.)

- ◆ TDS TMDL
  - ◆ Separated interflow background loads for non-mining land uses from permitted mining waste loads.



# Phased TMDLs

- ◆ Acknowledges uncertainties in load estimates and distribution of sources.
- ◆ Requires additional monitoring during a 2-yr period.
- ◆ Allows for adaptive implementation during that period with no additional permit requirements.
- ◆ Requires revision of the TMDL at the end of the 2-yr period.



# The Sediment Stressor

Lower North Fork Pound River

South Fork Pound River

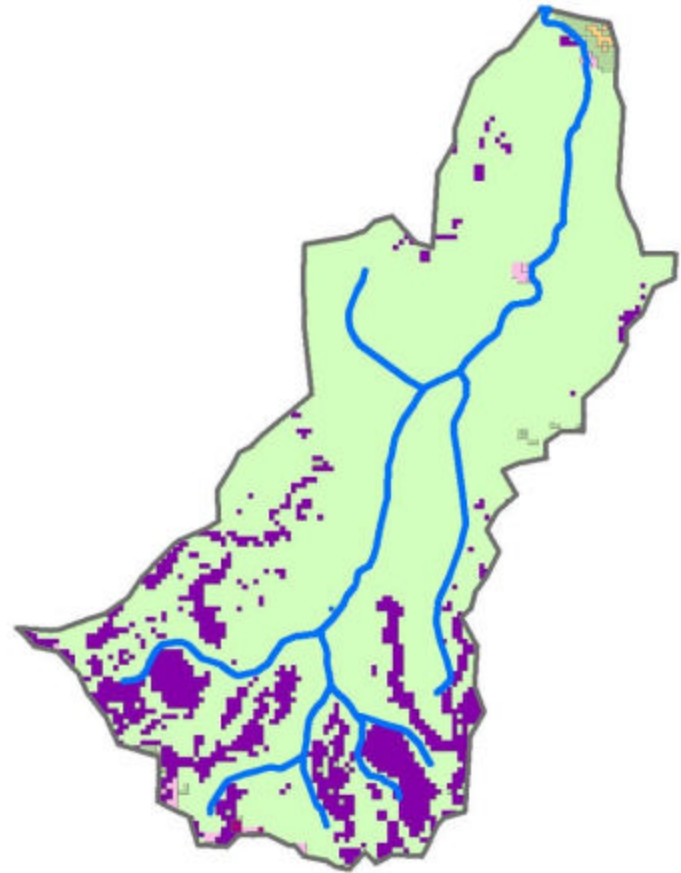
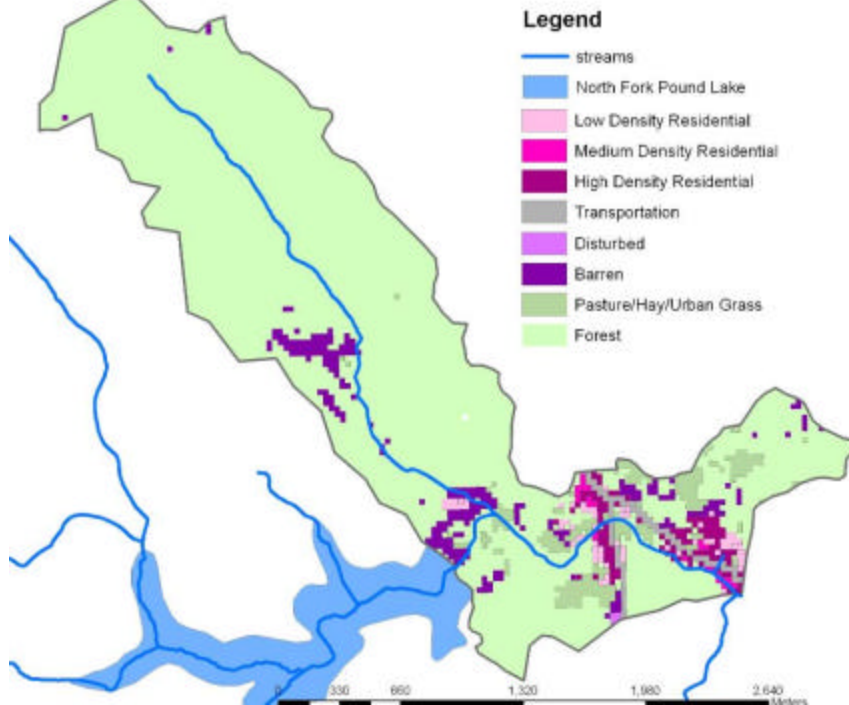
Phillips Creek

# Setting the Sediment (TSS) TMDL Endpoint for NF/SF Pound River

- ◆ No water quality standard for sediment (TSS)
- ◆ No current sediment criteria in mining permits for storms with a greater than 10-yr, 24-hr return interval
- ◆ Reference watershed approach
- ◆ Endpoint – simulated average annual Load

# Reference Watershed Selection for Sediment

Lower NF Pound River (466 ha)



Burns Creek (737 ha)

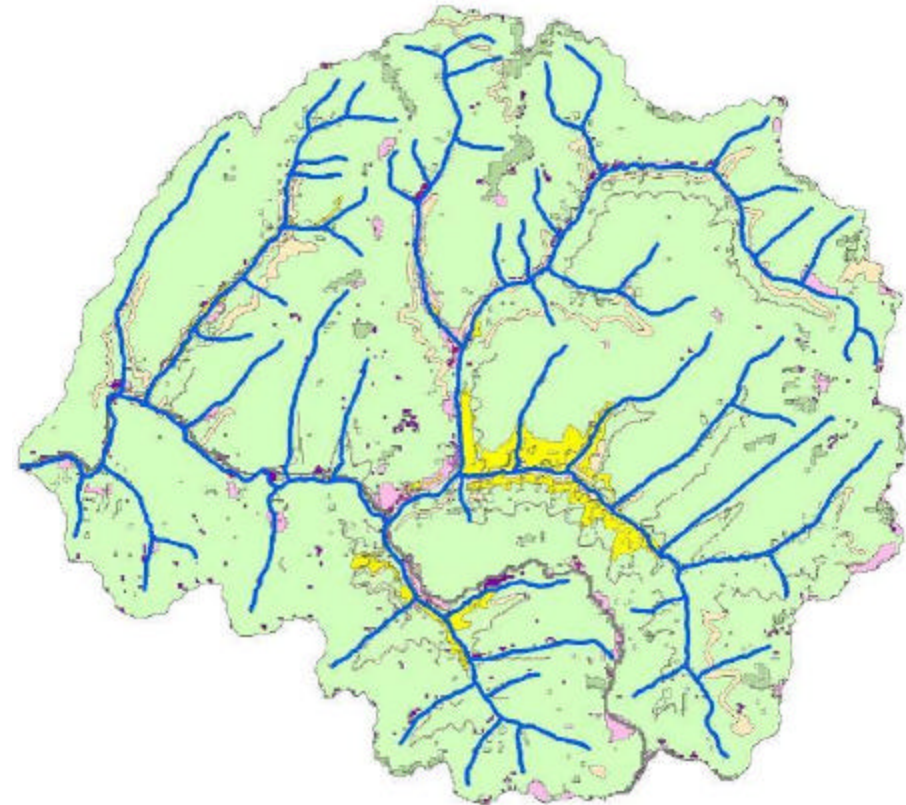
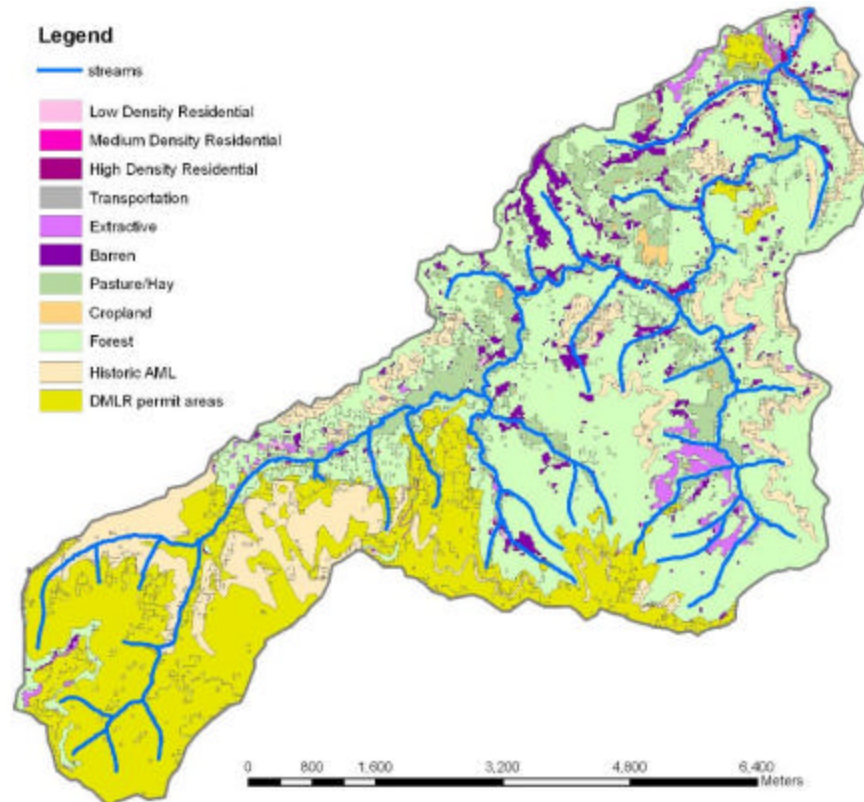


# Justification for Selection of Burns Creek

- ◆ Similarities with Lower NF Pound
  - ◆ Primarily forested
  - ◆ Size
  - ◆ No historic AML or active mining
  - ◆ Same Cumberland Mountains sub-ecoregion of the Central Appalachians
  - ◆ Average slope and soil erodibility
- ◆ Non-impaired

# Reference Watershed Selection for Sediment

SF Pound River (4,545 ha)



Upper Dismal Creek  
(7,228 ha)

# Justification for Selection of Upper Dismal Creek

- ◆ Similarities with SF Pound River
  - ◆ History of mining
  - ◆ High % forest; minimal % urban and agriculture
  - ◆ Same Cumberland Mountains sub-ecoregion of the Central Appalachians
  - ◆ Average slope and soil erodibility
- ◆ Non-impaired

# Sediment Modeling

- ◆ GWLF model
- ◆ NF/SF Pound River sub-watersheds
  - ◆ Lower North Fork Pound River (3)
  - ◆ South Fork Pound River (19)
    - ◆ Includes 1 sub-watershed each for Phillips Creek and Donald Branch
- ◆ Reference watersheds: Burns Creek and Upper Dismal Creek
- ◆ 13-year simulation (1995-2007)
  - ◆ Burns Creek – Wise weather data
  - ◆ Upper Dismal Creek – Richlands weather data
  - ◆ NF/SF Pound R – NF Pound Lake and Wise weather data



# Modeling Land Use Categories

Modeled Land Use Categories	Lower North Fork Pound River (ha)	Area-Adjusted Burns Creek (ha)	Phillips Creek (ha)	Area-Adjusted Upper Dismal Creek (ha)	South Fork** (ha)	Area-Adjusted Upper Dismal Creek (ha)
Cropland	0.0	0.6	0.1	0.1	19.5	0.5
Pasture	16.2	3.6	0.9	7.9	291.4	71.4
Hay	3.2	1.0	0.2	0.0	57.6	0.0
Forest	400.9	389.9	339.8	452.0	2,821.8	4,077.4
Barren	20.9	67.7	10.4	4.0	205.6	36.2
Mining						
Extractive	0.3	0.0	137.0	0.6	648.3	5.7
Reclaimed	0.0	0.0	9.9	0.4	152.5	3.9
Released	0.0	0.0	1.2	0.5	9.7	4.2
AML	0.0	0.0	4.2	24.0	303.3	216.7
LDR - pervious	5.7	2.3	0.0	8.6	14.5	77.8
MDR - pervious	1.6	0.0	0.0	0.0	0.3	0.2
HDR - pervious	3.4	0.2	0.0	0.4	4.4	3.3
Trans - pervious	1.3	0.0	0.0	0.7	1.3	6.6
LDR - impervious	0.8	0.3	0.0	1.2	2.0	10.6
MDR - impervious	0.7	0.0	0.0	0.0	0.1	0.1
HDR - impervious	6.3	0.3	0.0	0.7	8.2	6.0
Trans - impervious	4.8	0.0	0.0	2.7	4.8	24.6
<b>Total Area</b>	<b>465.9</b>	<b>465.9</b>	<b>503.8</b>	<b>503.8</b>	<b>4,545.3</b>	<b>4,545.3</b>
% Forest	86.0%	83.7%	67.4%	89.7%	62.1%	89.7%
% Agriculture	4.2%	1.1%	0.2%	1.6%	8.1%	1.6%
% Urban/residential	9.7%	15.2%	0.0%	2.8%	0.8%	2.8%
% Mining	0.1%	0.0%	32.3%	5.9%	29.0%	5.9%

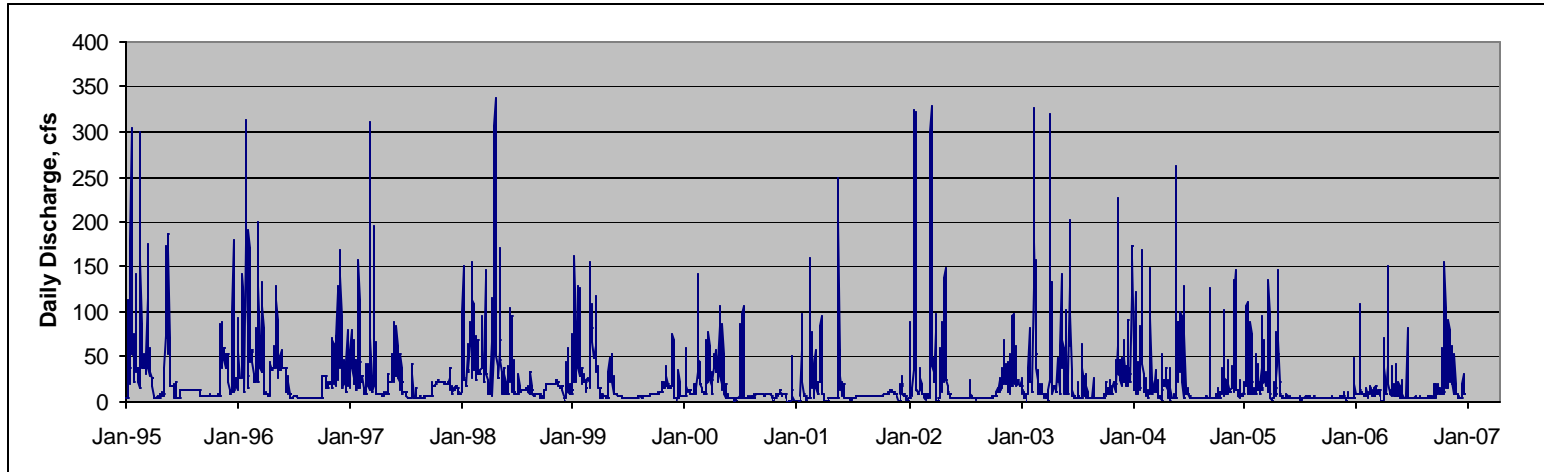
\*\* The South Fork Pound River watershed also includes Phillips Creek.

# Simulating Sediment Loads with GWLF

- ◆ Surface runoff from all land uses
- ◆ Erosion from all land uses
- ◆ Channel and stream bank erosion
- ◆ Supplemental time-series to simulate inputs from North Fork Lake

# Supplemental Sediment Modeling

## Loads from North Fork Pound Lake



- ◆ US Army Corps of Engineers stream gauging station
- ◆ Lake is a Public Water Supply and regulated for flood control
- ◆ 7' drawdown from Oct-Dec each year for flood storage
- ◆ Flow range is 0.8 – 338 cfs, average is 23 cfs
- ◆ Sediment estimated as 3 mg/L baseflow, 22 mg/L during storm flow (> 25cfs)

# Accounting for Existing BMPs

- ◆ NPDES Sediment ponds
- ◆ Variably effective by storm intensity and duration, installation and maintenance
- ◆ Average effectiveness for sediment removal (85-95%)
- ◆ Reduce loads from disturbed (extractive and reclaimed) areas in each sub-watershed (with ponds)



# GWLF Model Calibration

- ◆ Why calibrate?
  - ◆ GWLF developed for use without calibration
    - ◆ Previous modeling loads were large relative to observed data
  - ◆ Historically, GWLF used for relative reductions
    - ◆ From non-permitted sources
    - ◆ Restoration purely based on benthic macro-invertebrates
  - ◆ North Fork and South Fork Pound River
    - ◆ Permitted waste loads are monitored and tracked
    - ◆ Quantitative loads and reductions are essential

# Existing Sediment Loads

Sediment Sources	Lower North Fork Pound River (t/yr)	Area-adjusted Burns Creek (t/yr)	Phillips Creek (t/yr)	Area-adjusted Dismal Creek (t/yr)	South Fork Pound River** (t/yr)	Area-adjusted Dismal Creek (t/yr)
Cropland		0.9	0.5	0.2	37.3	1.3
Pasture	3.7	0.3	0.3	1.7	46.7	11.4
Hay	0.3	0.2	0.0		4.2	
Forest	52.6	53.5	52.1	72.4	315.4	494.4
Barren	263.1	304.7	165.0	54.2	2,125.0	370.4
Mining						
Extractive	11.9		222.4	4.2	1,270.1	28.9
Reclaimed			2.4	0.3	27.1	1.9
Released			2.2	0.8	12.9	5.4
AML			77.4	390.3	4,011.9	2,666.1
Pervious Urban	1.2	0.2	0.0	1.4	1.7	9.5
Impervious Urban	1.4	0.1	0.0	0.4	1.2	3.7
Channel Erosion	2.1	0.2	0.1	0.6	0.5	28.3
Outflow from Dam	344.5					
<b>Watershed Totals</b>	<b>680.8</b>	<b>359.9</b>	<b>522.5</b>	<b>526.4</b>	<b>7,854.1</b>	<b>3,621.1</b>

TMDL Annual Sediment Load Endpoints

# Existing Permitted Sediment Loads

Permit_ID	Facility Name	Permitted TSS Loads					
		Modeled Runoff (cm/yr)	Permitted Max Conc (mg/L)	Permitted Annual Load (t/yr)			
				Permit Total	Lower NF Pound River	Phillips Creek	SF Pound River*
DMLR Mining Permits							
1100033	FOX GAP MINE	19.04	70	4.54		4.25	4.54
1100044	STEER BRANCH PREP PLANT-#2 STRIP	19.04	70	0.11			0.11
1100520	H.E. #1 MINE	19.04	70	18.46		7.98	18.46
1100717	BUCK KNOB MINE	19.04	70	21.85			21.85
1100787	UPPER PHILLIPS CREEK MINE	19.04	70	23.62		12.02	23.62
1101102	MINE #2	19.04	70	2.50			2.50
1101270	FOUR LANE PERMIT	19.04	70	2.69			2.69
1101272	FLAT GAP MINE	19.04	70	64.05		1.24	64.05
1101401	NORTH FOX GAP SURFACE MINE	19.04	70	42.77			42.77
1101565	HIGH SPLINT SURFACE MINE #2	19.04	70	5.89		4.99	5.89
1101760	BACKBONE RIDGE SURFACE MINE	19.04	70	7.72		7.72	7.72
1201187	PHILLIPS CREEK DEEP MINE	19.04	70	0.85			0.85
1201338	STILLHOUSE BRANCH MINE	19.04	70	1.68			1.68
1201664	PARSONS #1 MINE	19.04	70	0.05		0.05	0.05
1501778	STRAIGHT FORK SURFACE MINE	19.04	70	0.09		0.09	0.09
1600876	WEST PHILLIPS CREEK MINE	19.04	70	26.23		25.73	26.23
1601939	CENTURION MINE	19.04	70	2.19			2.19
	Future Allocation for New Mining - Lower NF Pound R	19.04	70	0.35	0.35		
	Future Allocation for New Mining - Phillips Creek	19.04	70	0.67		0.67	
	Future Allocation for New Mining - SF Pound R	19.04	70	20.56			20.56
	* SF Pound River includes Phillips Creek						

Modeled runoff = average annual runoff from the “extractive” land use for mining permits

# Future Growth Allocation for Sediment

## ◆ Mining

- ◆ 10% increase in permitted mining area
- ◆ 400 acres
- ◆ Increased TSS = 35.4 t/yr

## ◆ Gas & Oil Well Construction

- ◆ 3 new wells / year
- ◆ Maximum disturbed area/site = 15 acres
- ◆ Increased TSS = 0.3 t/yr

# Phased Sediment TMDLs

## NF/SF Pound River

Impaired Segment	TMDL (t/yr)	WLA (t/yr)	LA (t/yr)	MOS (t/yr)
Lower North Fork Pound River VAS-Q13R-02	359.9	3.9	320.0	36.0
		Minimum Unspecified Future WLA: 3.6		
		Future Allocation for New Mining: 0.3		
Phillips Creek VAS-Q13R-04	526.4	64.8	409.0	52.6
		Existing Mining Permits: 64.06		
		Mining Permit Numbers	NPDES MPIDs	Permit WLAs
		1100033	none	4.25
		1100520	none	7.98
		1100787	none	12.02
		1101272	0001737, 3470068, 3470199, 3470200, 3470259	1.24
		1101565	0001239	4.99
		1101760	none	7.72
		1201664	none	0.05
		1501778	none	0.09
		1600876	none	25.73
		Future Allocation for New Mining: 0.67		
		Future Allocation for New G&O Construction: 0.07		
South Fork Pound River VAS-Q13R-01	3,621.1	246.1	3,012.9	362.1
		SFH General Permits (3): 0.12		
		Existing Mining Permits: 225.29		
		Mining Permit Numbers	NPDES MPIDs	Permit WLAs
		1100033	none	4.54
		1100044	none	0.11
		1100520	none	18.46
		1100717	2670086, 3470155, 3470156, 3470157, 3470158, 3470159, 347	21.85
		1100787	none	23.62
		1101102	3470072	2.50
		1101270	none	2.69
		1101272	0001737, 3470068, 3470199, 3470200, 3470259	64.05
		1101401	0005182, 3470286, 3470287, 3470288, 3470289, 3470290, 3470291, 3470293, 33470294	42.77
		1101565	0001239	5.89
		1101760	none	7.72
		1201187	3470069	0.85
		1201338	none	1.68
		1201664	none	0.05
		1501778	none	0.09
		1600876	none	26.23
		1601939	0004373, 0004374, 0005819, 0005820, 0006287	2.19
		Future Allocation for New Mining: 20.56		
		Future Allocation for New G&O Construction: 0.13		
G&O = Gas and Oil				
MPID = Monitoring point identification number				
SFH = Single family home				

Allocation Load Targets  
= TMDL – MOS

LNF = 323.9 t/yr  
PC = 473.8 t/yr  
SFP = 3,259.0 t/yr



# Sediment Load Allocation Scenarios

## Lower North Fork Pound River

Source Category	Lower North Fork Pound River % Reductions and Resulting Sediment Loads						
	Existing Loads	TMDL Alternative 1		TMDL Alternative 2		TMDL Alternative 3	
	(t/yr)	(% reduction)	(t/yr)	(% reduction)	(t/yr)	(% reduction)	(t/yr)
pasture/hay	4.0	52.4%	1.9	100.0%	0.0	0%	4.0
forest	52.6	52.4%	25.0	100.0%	0.0	0%	52.6
barren	263.1	52.4%	125.2	100.0%	0.0	58.7%	108.5
Mining							
extractive	11.9	52.4%	5.6	100.0%	0.0	0%	11.9
residential/urban	2.7	52.4%	1.3	100.0%	0.0	0%	2.7
channel erosion	2.1	52.4%	1.0	100.0%	0.0	0%	2.1
outflow from Dam	344.5	52.4%	163.9	6.0%	323.9	58.7%	142.1
<b>Total</b>	<b>680.8</b>		<b>323.9</b>		<b>323.9</b>		<b>323.9</b>

The TMDL target load for each alternative scenario is the TMDL minus the MOS.

Permitted mining WLA of 0.35 t/yr are reserved within the 'extractive' category.

Unspecified WLA loads, set as 1% of the TMDL (3.6 t/yr), are reserved within the 'barren' category.

Overall sediment reduction =  $(681 - 324)/681 = 52.4\%$

# Sediment Load Allocation Scenarios

## Phillips Creek

Source Category	Phillips Creek % Reductions and Resulting Sediment Loads						
	Existing Loads	TMDL Alternative 1		TMDL Alternative 2		TMDL Alternative 3	
	(t/yr)	(% reduction)	(t/yr)	(% reduction)	(t/yr)	(% reduction)	(t/yr)
cropland	0.5	0%	0.5	0%	0.5	0%	0.5
pasture/hay	0.4	0%	0.4	0%	0.4	0%	0.4
forest	52.1	9.3%	47.2	0%	52.1	0%	52.1
barren	165.0	9.3%	149.6	20.1%	131.9	0%	165.0
Mining							
extractive	222.4	9.3%	201.7	0%	222.4	0%	222.4
reclaimed	2.4	9.3%	2.1	0%	2.4	0%	2.4
released	2.2	9.3%	2.0	0%	2.2	0%	2.2
AML	77.4	9.3%	70.2	20.1%	61.9	62.9%	28.7
residential/urban	0.0	0%	0.0	0%	0.0	0%	0.0
channel erosion	0.1	9.3%	0.1	0%	0.1	0%	0.1
<b>Total</b>	<b>522.5</b>		<b>473.8</b>		<b>473.8</b>		<b>473.8</b>
The TMDL target load for each alternative scenario is the TMDL minus the MOS.							
Permitted mining WLA of 64.73 t/yr are reserved within the 'extractive' category.							
Permitted G&O construction WLA of 0.07 t/yr are reserved within the 'barren' category.							

$$\text{Overall sediment reduction} = (523-474)/523 = 9.3\%$$

# Sediment Load Allocation Scenarios

## South Fork Pound River

Source Category	South Fork Pound River**						
	% Reductions and Resulting Sediment Loads						
	Existing Loads	TMDL Alternative 1		TMDL Alternative 2		TMDL Alternative 3	
	(t/yr)	(% reduction)	(t/yr)	(% reduction)	(t/yr)	(% reduction)	(t/yr)
cropland	37.3	15.0%	31.8	0%	37.3	0%	37.3
pasture/hay	50.9	15.0%	43.3	0%	50.9	0%	50.9
forest	315.4	15.0%	268.2	0%	315.4	0%	315.4
barren	2,125.0	15.0%	1,807.0	16.8%	1,767.9	27.1%	1,549.9
Mining							
extractive	1,270.1	15.0%	1,080.0	16.8%	1,056.6	0%	1,270.1
reclaimed	27.1	15.0%	23.0	16.8%	22.5	0%	27.1
released	12.9	15.0%	11.0	0%	12.9	0%	12.9
AML	4,011.9	100.0%	0.0	100.0%	0.0	100%	0.0
residential/urban	3.0	15.0%	2.5	0%	3.0	0%	3.0
channel erosion	0.5	15.0%	0.4	0%	0.5	0%	0.5
Upstream Load Reduction	-8.1	0%	-8.1	0%	-8.1	0%	-8.1
<b>Total</b>	<b>7,846.0</b>		<b>3,259.0</b>		<b>3,259.0</b>		<b>3,259.0</b>

The TMDL target load for each alternative scenario is the TMDL minus the MOS.

\*\* Includes allocated load from Phillips Creek

Permitted mining WLA of 245.85 t/yr are reserved within the 'extractive' category.

Permitted G&O construction WLA of 0.13 t/yr are reserved within the 'barren' category.

Permitted residential septic system WLA of 0.12 t/yr are reserved within the 'residential/urban' category.

Overall sediment reduction =  $(7,846 - 3,259)/7,846 = 58.5\%$



# The Total Dissolved Solids (TDS) Stressor

## South Fork Pound River

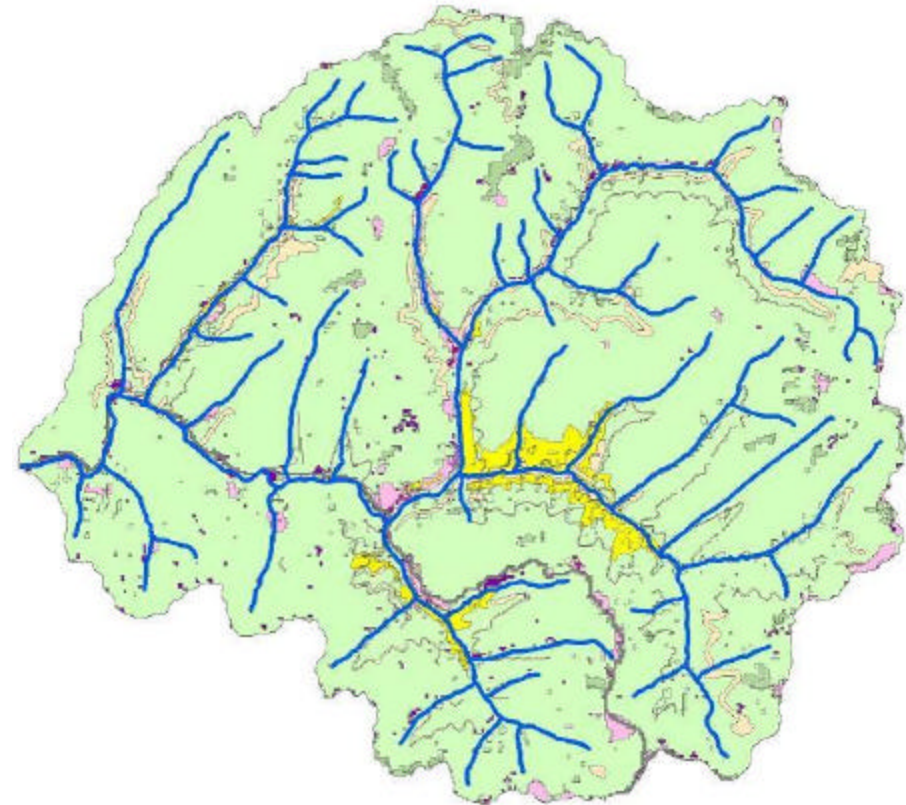
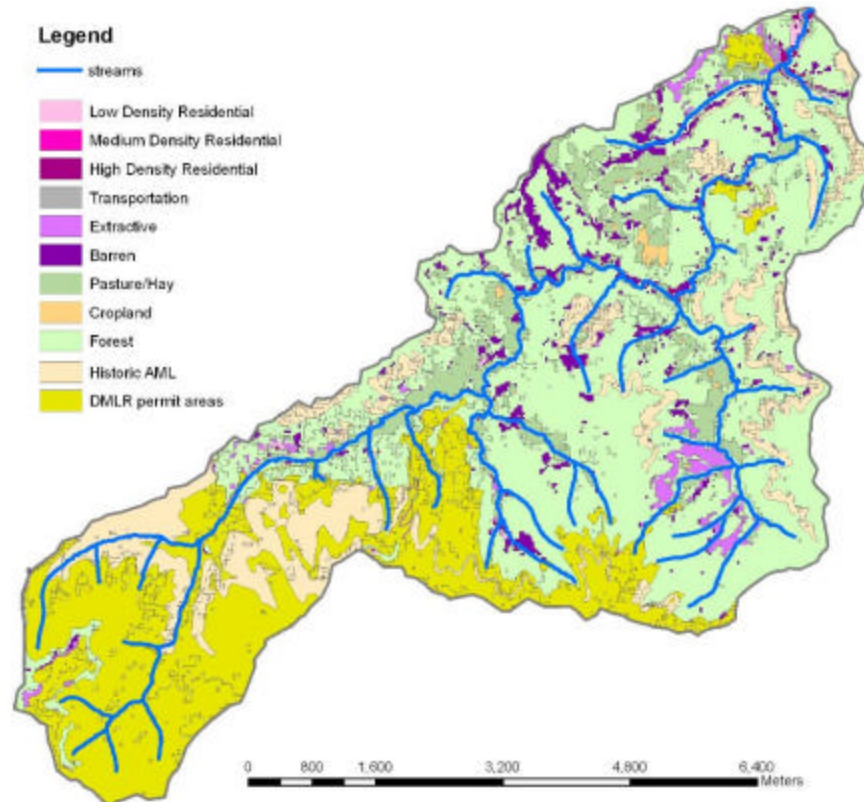
### Phillips Creek

# Setting the TDS TMDL Endpoint for NF/SF Pound River

- ◆ No water quality standards for TDS
- ◆ No current TDS criteria in mining permits
- ◆ Reference watershed approach
- ◆ Endpoint – 90<sup>th</sup> percentile concentration (369 mg/L)
  - ◆ Lower Dismal Creek

# Reference Watershed Selection for Sediment, no TDS

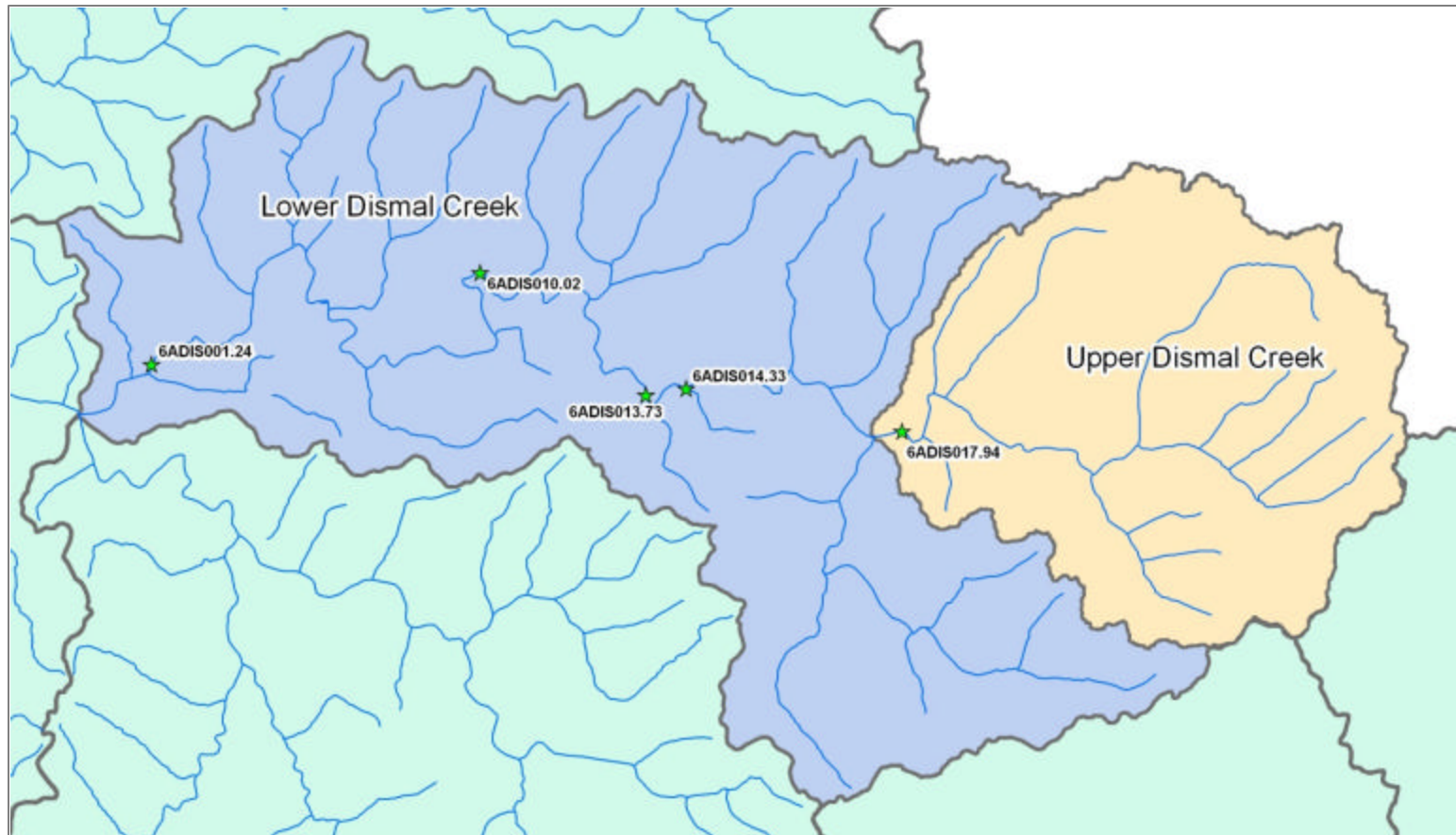
SF Pound River (4,545 ha)



Upper Dismal Creek  
(7,228 ha)



# Upper and Lower Dismal Creek





# Justification for Lower Dismal Creek

- ◆ DEQ monitored TDS data available downstream at 6ADIS001.24
- ◆ Not impaired (6ADIS003.52 or 6ADIS017.94)
- ◆ Similarities with SF Pound River
  - ◆ History of mining, though smaller percentage
  - ◆ Same Cumberland Mountains sub-ecoregion of the Central Appalachians
- ◆ Has been used as the reference for the Knox Creek TDS TMDL in the same region

# TDS Modeling

- ◆ HSPF model
- ◆ SF Pound River (19) sub-watersheds, including nested sub-watersheds Phillips Creek and Donald Branch
- ◆ North Fork Pound Lake and Wise NWS weather data
- ◆ Hydrology calibration based on a surrogate watershed, Cranes Nest River, refined with observed DMLR in-stream concentrations
- ◆ TDS multi-reach calibration with observed DMLR in-stream concentrations

# Sources of TDS

- ◆ permitted mining sources
- ◆ abandoned mine land (AML)
- ◆ pre-law mine discharges
- ◆ straight pipes and failing septic systems
- ◆ road salt
- ◆ background

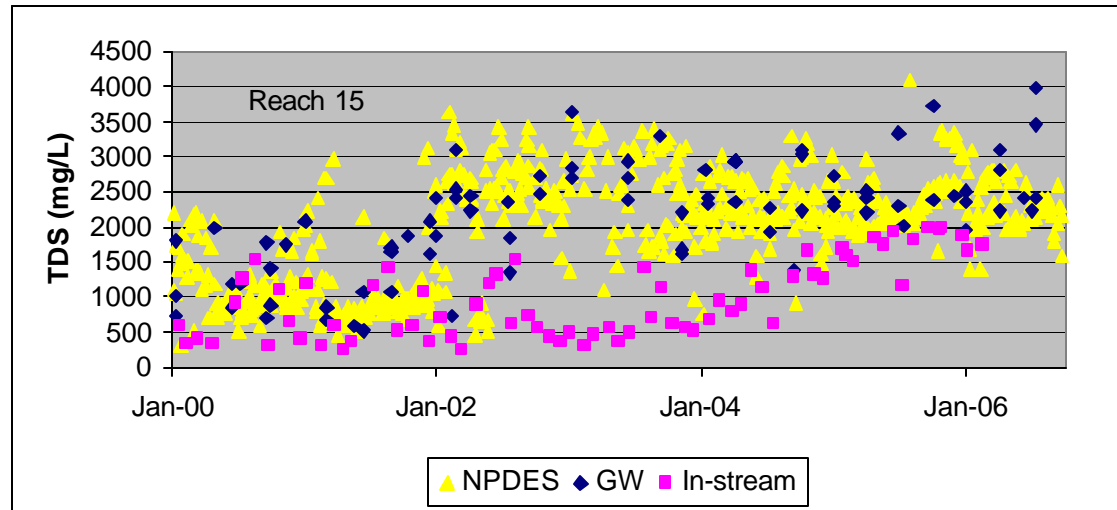
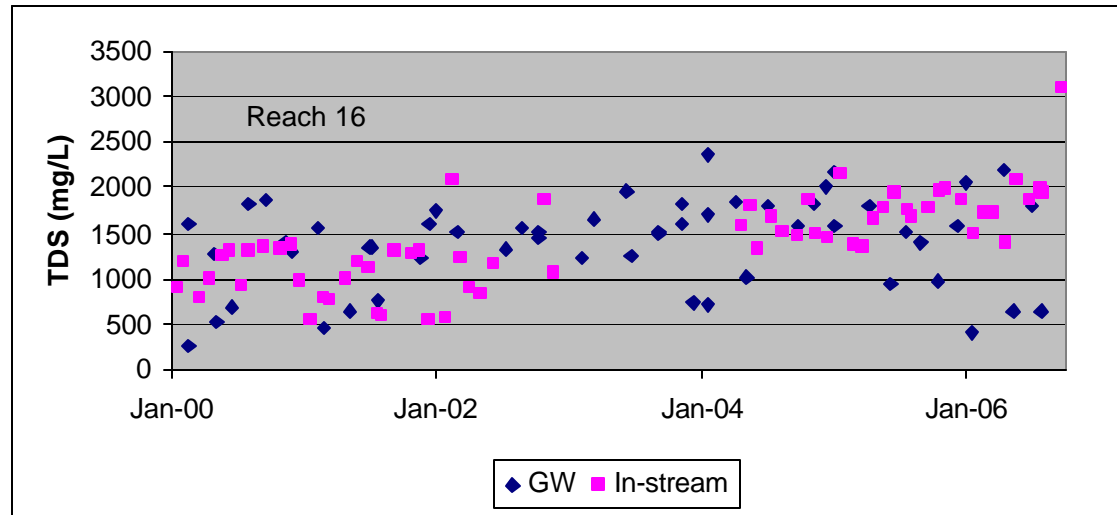
# Simulating TDS Sources in HSPF

- ◆ Surface Buildup subject to Runoff
  - ◆ Permitted Mining Areas (extractive, barren, reclaimed, released)
  - ◆ Abandoned Mine Land (AML)
  - ◆ Road salt
- ◆ Contributions from Interflow and Groundwater (combined background and mining influences)
- ◆ Point Sources
  - ◆ Straight pipes and failing septic systems
  - ◆ Pre-law mine discharges – direct to stream

# Monthly TDS Time-series Inputs in HSPF

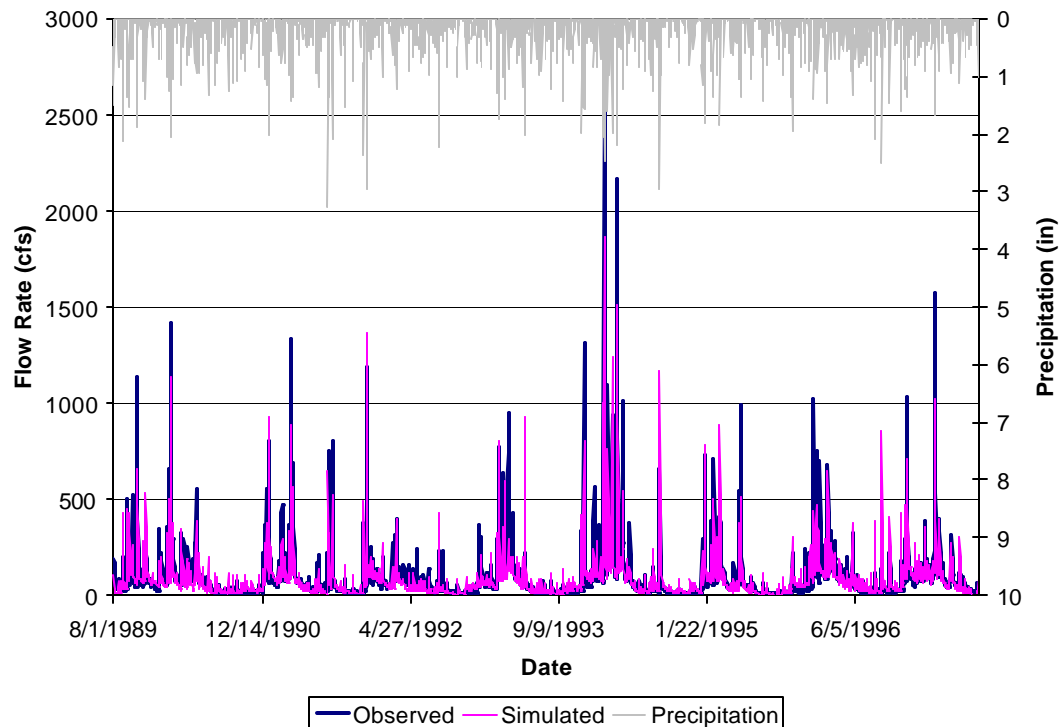
- ◆ Road salt buildup
  - ◆ VDOT application rate
  - ◆ named, paved road miles
  - ◆ days with snow events > 0.5 inches and maximum daily temperature > 32°F
- ◆ Average Monthly [TDS] in Groundwater
  - ◆ calculated from all DMLR monitored data for headwater sub-watersheds and
  - ◆ derived from 4-sample moving average in-stream TDS concentrations for downstream sub-watersheds
- ◆ Pre-Law Mine Discharges
  - ◆ Interpolated from monitored DMLR data

# Relationship between DMLR In-stream and GW Monitoring Data



# Initial Hydrologic Calibration

- ◆ No continuous flow gauge on NF/SF Pound
- ◆ USGS flow data from nearby Cranes Nest River
- ◆ Calibration performed using HSPEXP





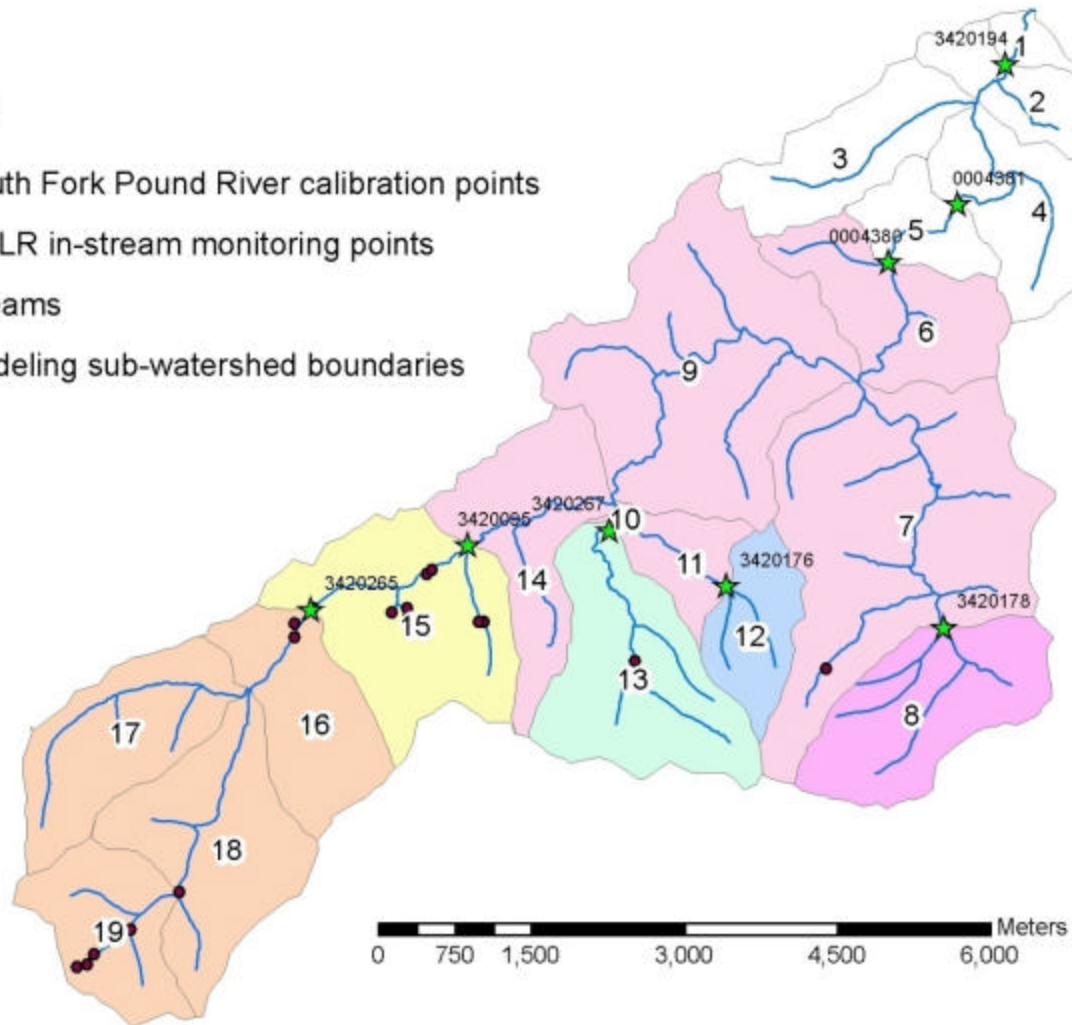
# Location of DMLR Calibration Points

## Legend

- ★ South Fork Pound River calibration points
- DMLR in-stream monitoring points

— streams

□ Modeling sub-watershed boundaries



# Selected Calibration Periods

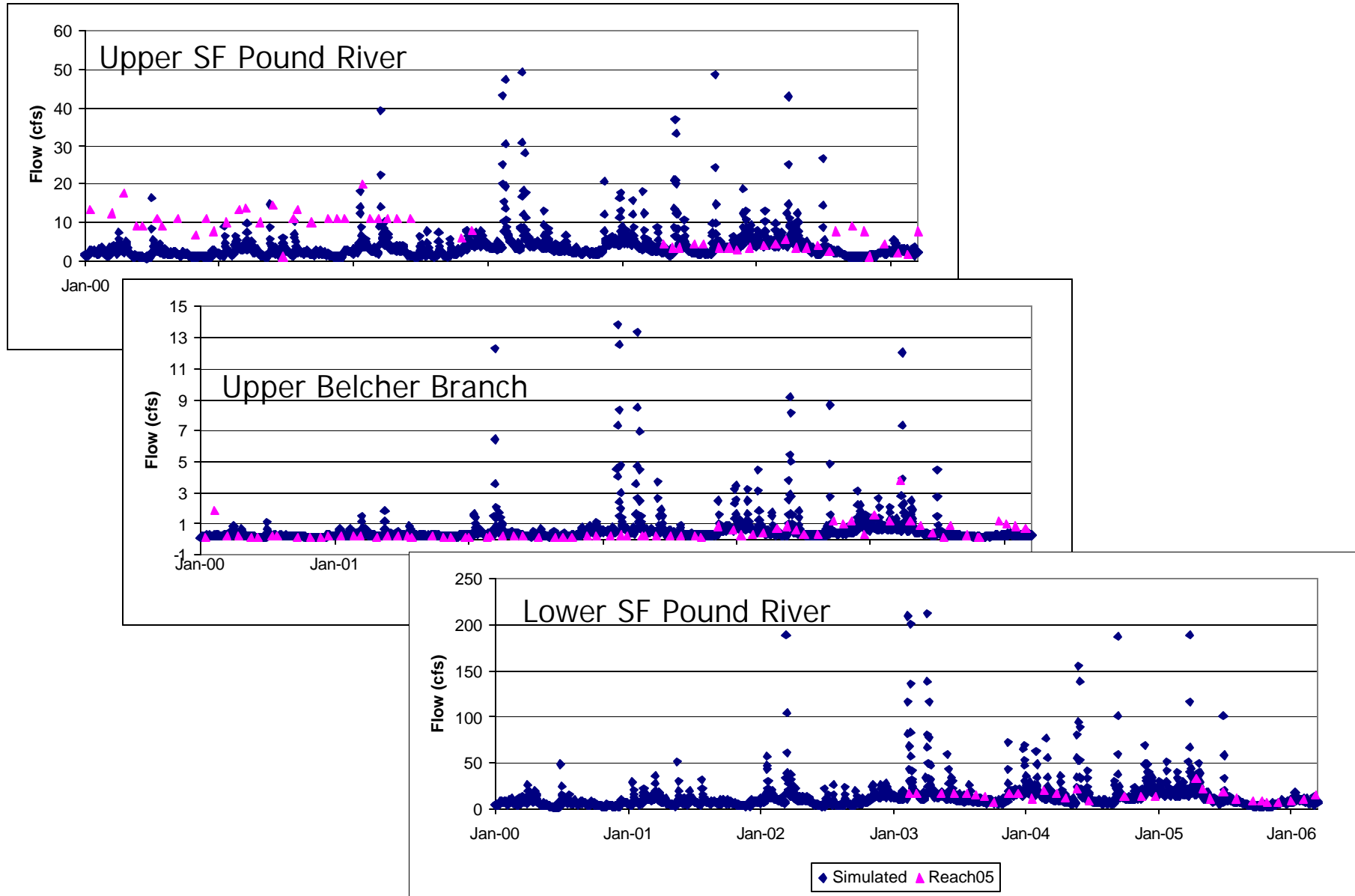
- ◆ Hydrology:

- ◆ Fine-tune calibrated parameter values from Cranes Nest River
- ◆ Entire period of DMLR electronic data (Jan 1994 – Dec 2006)

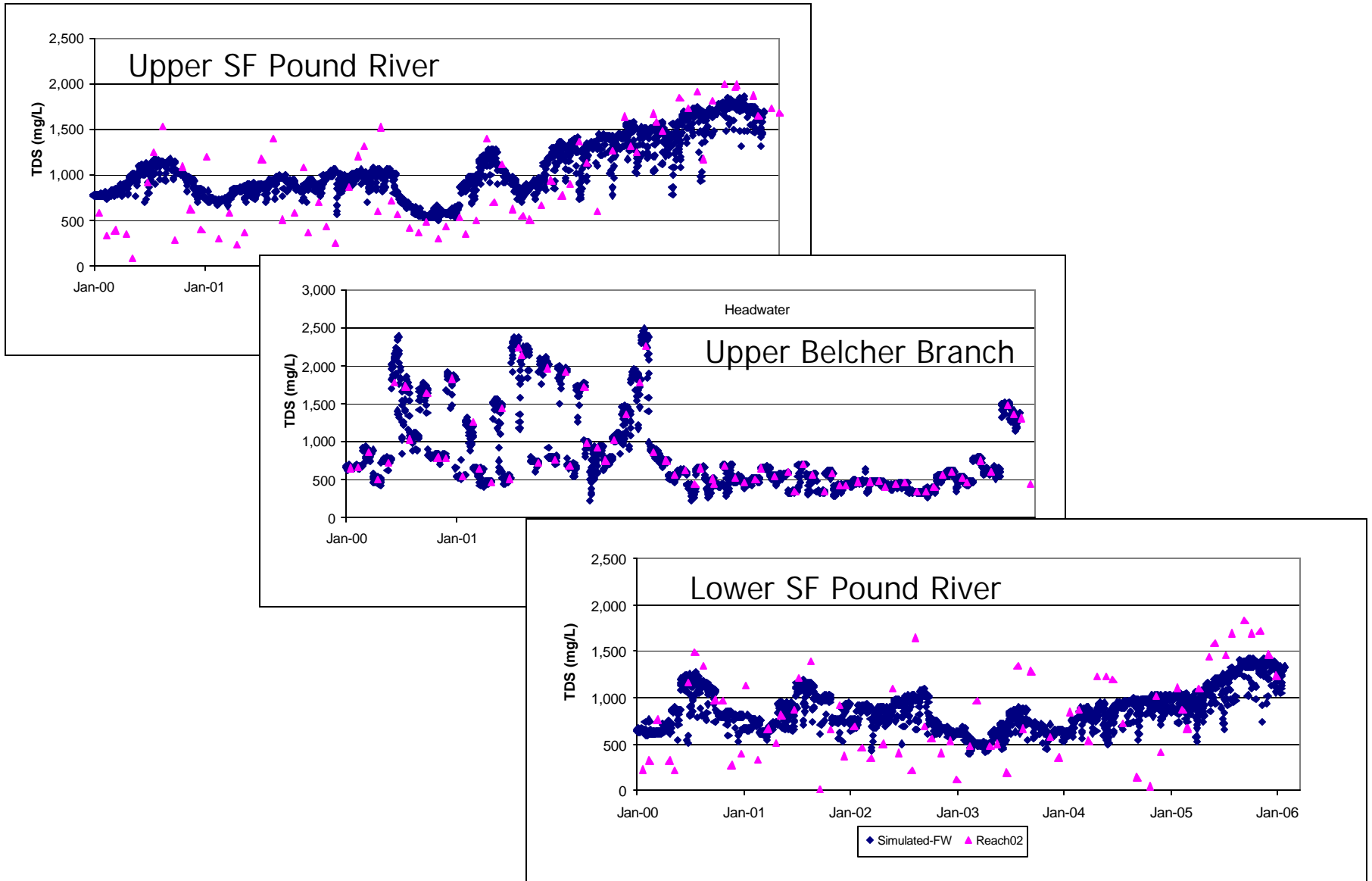
- ◆ TDS:

- ◆ Land use changes occurred during the DMLR monitoring period
- ◆ More recent period selected to be representative of mining activities (Jan 2000 – Jan 2006)
- ◆ Same period used for calibration and TMDL modeling

# Multiple-Point Flow Calibration with DMLR In-stream Data



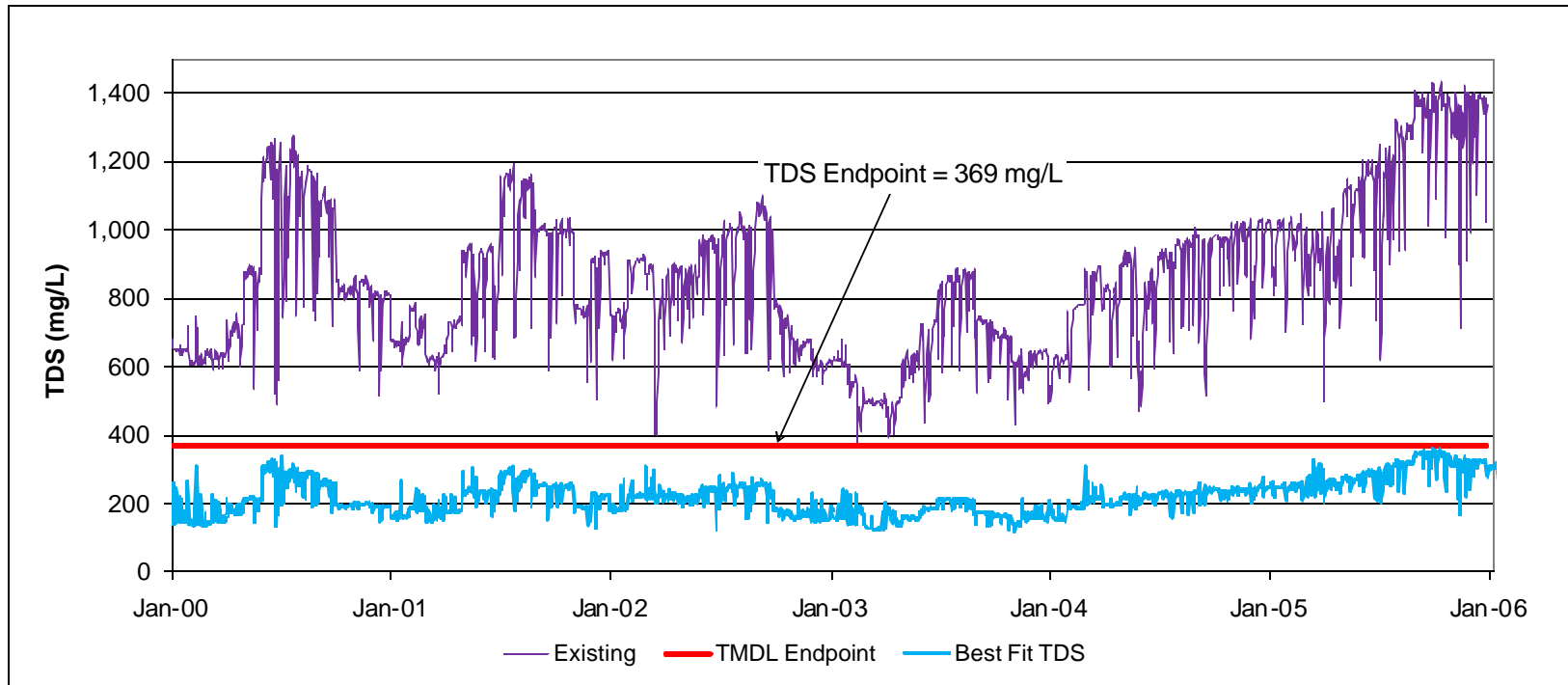
# Multiple-Point TDS Calibration with DMLR In-stream Data



# Existing TDS Loads

<b>TDS Sources</b>	<b>Phillips Creek (kg/yr)</b>	<b>SF Pound River* (kg/yr)</b>
Permitted Mining	1,512,101	8,552,267
Pre-law mine discharge	25,371	60,494
AML	26,268	1,021,794
Background	41,791	402,806
Road salt	556	69,751
Residential	224	10,471
<b>Total</b>	<b>1,606,310</b>	<b>10,117,581</b>
* Includes Phillips Creek		

# Simulated Existing and Allocated Scenarios South Fork Pound River



# TDS Load Allocation Scenarios

Model Run	Scenario	Percent Reductions by Source (%)								SF Pound River (SFP)*			Phillips Creek (PC)		
		Mining		AML		Pre-Law Mine Discharge	Background	Road Salt	Residential	Max Ave Daily TDS (mg/L)	Resulting TDS Load (kg/yr)	Overall % Load Reduction	Max Ave Daily TDS (mg/L)	Resulting TDS Load (kg/yr)	Overall % Load Reduction
		IF + GW	Surface Runoff	IF + GW	Surface Runoff										
Base	0	0	0	0	0	0	0	0	0	1,433	10,118,008		1,803	1,606,310	
Run1	1	0	0	100	100	0	0	0	100	1,391	9,087,817	10.2%	1,796	1,579,818	1.6%
Run2	2	60	60	100	100	60	0	0	100	558	4,173,303	58.8%	789	714,338	55.5%
Run3	3	80	80	100	100	80	0	0	100	313	2,525,654	75.0%	732	423,680	73.6%
Run4	4	90	90	100	100	90	0	0	100	245	1,690,319	83.3%	700	275,706	82.8%
Run5	5	95	95	100	100	100	0	0	100	222	1,248,995	87.7%	665	195,721	87.8%
Run6	6-PC	99	99	100	100	100	0	0	100	218	1,162,723	88.5%	517	109,005	93.2%
	6-SFP	95	95	100	100	100	0	0	100						
Run8	8-PC	99.7	99.7	100	100	100	0	0	100	361	2,914,713	71.2%	333	73,049	95.5%
	8-SFP	69	69	100	100	100	0	0	100						
* Includes Phillips Creek															
Road salt and background loads were not reduced.											= Meets TMDL endpoint (369 mg/L).				
Residential includes Failing Septics and Straight Pipes.															

Overall TDS reduction =  
 SF Pound River: 71.2%  
 Phillips Creek: 95.5%

Corresponding TMDL  
 TDS Loads



# Phillips Creek TDS TMDL

Phillips Creek VAS-Q13R-04

TMDL (kg/yr)	WLA* (kg/yr)			LA** (kg/yr)	MOS (kg/yr)
64,847	22,756			42,091	Implicit
	Mining Permit Numbers	NPDES MPIDs	Permit WLAs		
	1100033	none	1,968		
	1100520	none	3,611		
	1100787	none	4,904		
	1101272	0001737, 3470068, 3470199, 3470200, 3470259	575		
	1101565	1239	920		
	1101760	none	1,554		
	1201664	none	7		
	1501778	none	13		
	1600876	none	9,204		

\*\* LA includes loads from Road Salt and Interflow from non-mining land uses.

# South Fork Pound River TDS TMDL

South Fork Pound River VAS-Q13R-01*				
TMDL (kg/yr)	WLA** (kg/yr)			LA** (kg/yr)
1,265,457	696,990			568,467
	Mining Permit Numbers	NPDES MPIDs	Permit WLAs	MOS (kg/yr)
	1100033	none	4,045	
	1100044	none	456	
	1100520	none	76,531	
	1100717	2670086, 3470155, 3470156, 3470157, 3470158, 3470159, 3470160	144,373	
	1100787	none	84,348	
	1101102	3470072	12,627	
	1101270	none	12,318	
	1101272	0001737, 3470068, 3470199, 3470200, 3470259	66,748	
	1101401	0005182, 3470286, 3470287, 3470288, 3470289, 3470290, 3470291, 3470293, 33470294	209,902	
	1101565	1239	1,639	
	1101760	none	1,554	
	1201187	3470069	5,847	
	1201338	none	8,516	
	1201664	none	7	
	1501778	none	13	
	1600876	none	9,790	
	1601939	0004373, 0004374, 0005819, 0005820, 0006287	58,277	

\* Includes Phillips Creek

\*\* LA includes loads from Road Salt, Interflow loads from non-mining land uses, and Groundwater loads from sub-watersheds without mining permits.

# Suggested First Things To Do

- ◆ Remining and reclamation of AML areas
- ◆ Establish vegetative cover on barren areas
- ◆ Establish stream buffers near riparian residential/urban areas
- ◆ Use BMPs that reduce the disturbed surface footprint
- ◆ Cover exposed materials with soil to prevent weathering and reduction of metals
- ◆ Conduct additional TSS and TDS monitoring to improve characterization of sources
- ◆ Any TSS > 70 mg/L should trigger a re-assessment of BMPs recommended in DMME guidance

# Contact Information

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540-231-2538



- ◆ NF/SF Pound River Phased TMDLs (Benthic Impairment)

<http://www.deq.state.va.us/tmdl/develop.html>